The Effect of Diversification Relatedness on Firm Performance

Brandon C. L. Morris,[1] Stephen G. Fier,[2] and Andre P. Liebenberg[3]

Abstract: This paper investigates the relationship between diversification relatedness and firm performance in the U.S. property-liability insurance industry. While prior research has evaluated the effect of diversification on insurer performance, little evidence exists regarding the relation between diversification *strategy* and performance for diversified firms. Theory suggests that potential costs and benefits are associated with related and unrelated forms of diversification and that these can vary along the relatedness continuum. We test for the net effect of diversification strategy and find that relatedness negatively impacts accounting performance. This relatedness penalty is robust to corrections for potential endogeneity bias, it exists for newly diversifying firms, and it has a differential effect on stock and mutual insurers. Finally, we find that related diversification is largely responsible for the diversification penalty found in prior research while unrelated diversification has no relation to accounting performance.

INTRODUCTION

The coexistence of diversified and focused firms in the U.S. property-liability (P/L) insurance industry has been a topic of empirical interest over the past two decades, with studies commonly focused on explaining performance differences across these two groups (e.g., Hoyt and Trieschmann, 1991; Liebenberg and Sommer, 2008; Elango, Ma, and Pope, 2008; Cummins, Weiss, Xie, and Zi, 2010). Although firms have the ability to select a strategy of diversification or focus, prior research largely ignores the fact that diversified insurers must also select a *diversification strategy* of either related or unrelated diversification. In other words, some diversified firms offer products in relatively similar lines of business (related

[1]Contact author; Wright State University, brandon.morris@wright.edu

[2]University of Mississippi, sfier@bus.olemiss.edu

[3]University of Mississippi, aliebenberg@bus.olemiss.edu

Journal of Insurance Issues, 2017, **40** (2): 125–158.

diversification) while others offer products across very dissimilar lines of business (unrelated diversification).[4]

Prior literature suggests that there are a number of important advantages and disadvantages associated with related and unrelated diversification strategies (e.g., Hill, Hitt, and Hoskisson, 1992; Palich, Cardinal, and Miller, 2000). The advantages of related diversification have been argued to arise from the ability of firms to exploit economies of scope (Teece, 1982). However, inefficient resource sharing, resource overstretching, and overutilized management could lead to increased costs for firms employing a related diversification strategy (e.g., Teece, 1982). Theory suggests that unrelated diversifiers benefit from advantages stemming from efficient internal governance economies (Williamson, 1985) and imperfectly correlated income streams (Lewellen, 1971; Barney, 1997). The efficient internal governance argument implies that top management can address division-level inefficiencies, terminate underperforming managers, and better allocate capital than can outside investors. In this respect the individual divisions can run more efficiently than comparable single-division firms (Hill et al., 1992). Imperfectly correlated income streams may also help reduce insurer risk, improve risk pooling, and reduce the negative effects the business cycle may have on primary income sources.[5]

This study investigates the relation between diversification strategy and financial performance. By focusing on diversification *strategy*, we are better able to distinguish which set of economic benefits equate with better performance. Using a unique line-of-business relatedness measure introduced by Berry-Stölzle, Liebenberg, Ruhland, and Sommer (2012, BLRS 2012 hereafter), we test how diversification strategy affects the performance of multi-line P/L insurers. Our results indicate that insurers employing an *unrelated* diversification strategy exhibit stronger accounting performance than insurers employing a more *related* diversification strategy. This finding is confirmed in both univariate and multivariate settings. We also test whether this relatedness-penalty is confined to stock or mutual insurers. We find that the relatedness penalty is isolated to our subsample of stock insurers, consistent with the managerial discretion hypothesis (Mayers and Smith, 1982). Finally, we examine newly diversified insurers

[4]A firm's diversification "strategy" can encompass a broad set of actions that may be taken by a firm, and one component of that strategy includes the decision to diversify into related or unrelated lines of business. While we recognize that this term can refer to much broader decisions and activities, we use the term "strategy" throughout this study specifically to describe the decision to employ either related or unrelated diversification.

[5]The concept of unrelated income streams reducing risk is commonly referred to as the coinsurance effect (Lewellen, 1971).

and find that those firms that enter highly related lines experience lower accounting performance than firms that diversify into more unrelated lines. Taken together, we find strong evidence that diversification strategy influences firm performance, where firms employing a strategy of unrelated diversification exhibit greater profitability relative to firms employing a strategy of related diversification.

The remainder of this article is organized as follows. First, we discuss the relevant literature as it relates to diversification, diversification strategy, and insurer financial performance. Next we present our hypotheses as well as discuss the methodology and variables employed in the study. Empirical results follow, and then we conclude.

PRIOR LITERATURE

Diversification-Performance Relationship

Financial economists have been studying the implications of corporate diversification and diversification strategy for decades.[6] Lang and Stulz (1994) and Berger and Ofek (1995, 1999) initially provided strong evidence that firms operating in multiple industrial segments are penalized by a market discount. However, researchers have posited that the finding of a diversification discount may be the result of irregularities in segment-level data and that diversification may actually lead to a diversification premium (Villalonga, 2004). Furthermore, Hyland and Diltz (2002) and Campa and Kedia (2002) argue that *a priori* firm characteristics, namely low growth opportunity and excess cash reserves, account for the diversification discount identified by Berger and Ofek (1995). More recently, Santalo and Becerra (2008) find that the performance-diversification relationship is not homogeneous across industries, but that diversification is associated with positive performance in industries dominated by diversified firms, and negative in industries dominated by single segment firms.

The diversification literature related to P/L insurers appears to be more unified in its assessment of a negative diversification-performance relationship than the general finance literature. Hoyt and Trieschmann (1991) report that while both specialized and diversified firms outperform market benchmarks, specialized firms outperformed diversified firms from 1973 to 1987. Tombs and Hoyt (1994) also report higher risk-adjusted returns for

[6]Martin and Sayrak (2003) provide an overview of the diversification-performance literature, noting three distinct "waves" of literature, with the first wave finding evidence of a diversification discount, the second wave questioning the existence of a diversification discount, and the third wave providing evidence of a diversification premium.

specialized insurers' equities. More recently, Liebenberg and Sommer (2008) provide evidence of a performance penalty and market discount among diversified P/L insurers. Elango et al. (2008) also identify a diversification-performance penalty, but note that this relationship is nonlinear in nature. Using data envelopment analysis (DEA), Cummins et al. (2010) find that more-focused firms are more efficient than diversified firms. Shim's (2011) empirical results also suggest a performance disparity in product-diversified firms, with more-focused insurers outperforming product-diversified insurers.[7] Taken together, the literature suggests that diversification generally has a negative impact on firm performance for firms operating in the U.S. P/L insurance industry.

Diversification Strategy–Performance Relationship

Potential benefits of related and unrelated diversification strategies

Firms that choose to diversify can select a strategy of related diversification or unrelated diversification. Prior literature suggests that firms will select related diversification when the costs of producing separate outputs exceed the costs of joint production (i.e., economies of scope). For insurers, the benefits gained through economies of scope can be achieved by employing a senior management team to make business decisions across multiple segments, taking advantage of existing marketing channels (e.g., multi-policy sales and distribution), taking advantage of multi-line adjustors, combining underwriting and claims services across lines, transferring brand name and reputation across products/services, or exploiting closely related technologies (underwriting or actuarial). Alternatively, insurers can select a strategy of unrelated diversification, which may provide some unique advantages of its own derived primarily from greater risk reduction (Barney, 1997). Portfolio theory suggests that overall risk can be reduced with a collection of assets with imperfectly correlated values. In an insurance setting, having uncorrelated premium and claim flows can improve risk pooling and stabilize profits across the business cycle (i.e., a coinsurance effect). For example, an insurer can exploit unrelated diversification when a business line is subject to market contractions by allocating human resources and capital to business lines that may be unaffected by the contraction.

[7]Berry-Stölzle, Hoyt, and Wende (2013) examine the diversification-performance relationship across multiple countries and find that the relationship is also dependent on country-specific factors such as capital market development, property rights protection, and competition.

Potential costs of related and unrelated diversification strategies

Although firms will select a particular diversification strategy because of the potential benefits associated with that option, various costs linked to related and unrelated diversification could limit or even dominate any positive effect. For instance, while economies of scope may be derived through the use of related diversification, such a strategy could also have a deleterious effect on firm performance as a result of inefficient resource sharing, resource overstretching, and over-utilized management (Teece, 1982). For firms selecting an unrelated diversification strategy, there is the possibility that limited synergies exist between the various segments of the firm and that diseconomies of scope develop as the organization attempts to manage the unrelated operations (Palepu, 1985). These firms may also be more vulnerable to external market changes, such as a decline in demand for their products and services (Pehrsson, 2006). Any of these aforementioned outcomes could increase the costs incurred by the firm and ultimately lead to a reduction in firm performance rather than enhance performance.

Empirical evidence on the net effect of related and unrelated diversification

While prior literature has recognized that firms may select different diversification strategies, evidence regarding the diversification strategy-performance relation is mixed. Numerous studies have found support for the superiority of related diversification over unrelated diversification (e.g., Rumelt, 1974, 1982; Christensen and Montgomery, 1981; Palepu, 1985; Bae, Kwon, and Lee, 2011). While there are many explanations as to why a strategy of relatedness is associated with better performance, most cite the creation of synergies as a result of efficient resource sharing (e.g., Teece, 1980).

Although some previous studies have found a positive relation between relatedness and firm performance, other studies have reported conflicting results. Teece (1982) suggests that firms that attempt to leverage the same resources for an increased number of activities can experience weaker performance due to congestion.[8] Michel and Shaked's (1984) evidence suggests that firms diversifying in unrelated sectors are able to

[8]It is important to note that common resources include both physical assets and human capacity. "For instance, if the common input is knowhow, …then the costs of accessing it may increase if the simultaneous transfer of the information to a number of different applications is attempted. … Accordingly, as the demands for sharing knowhow increase, bottlenecks in the form of over-extended scientists, engineers, and managers can be anticipated. Congestion associated with accessing common inputs will thus clearly limit the amount of diversification which can be profitably engaged (Teece, 1982, page 53)."

generate "statistically superior performance" over firms with more-related business segments. Fan and Lang (2000) report that firms with vertically related segments are, on average, associated with lower value during the 1980's and 1990's. The authors find that firm value is negatively associated with relatedness and they reject the notion that related diversification always improves firm value. Using perceptual survey data from top industry executives as his basis for relatedness, Pehrsson (2006) identifies a negative relation between "high relatedness" and firm performance.

Finally, some empirical studies have found no significant relation between diversification strategy and performance after controlling for industry characteristics, lagged performance, or using different relatedness measures (e.g., Christensen and Montgomery, 1981; Hill et al., 1992).

While there is ample literature regarding the diversification-performance relationship in the U.S. insurance industry, little research exists which explicitly focuses on the performance implications of diversification *strategy* within the P/L industry. To the best of our knowledge, Li and Greenwood (2004) is the only other study that empirically tests relatedness and performance in an insurance setting. Using a sample of 276 diversified Canadian insurers, the authors find that the extent of diversification is an insignificant predictor of firm performance, but that market niche relatedness is positively associated with performance.

HYPOTHESIS DEVELOPMENT

Diversification Strategy Hypothesis

The most common theoretical rationale supporting the dominance of a related diversification strategy are the benefits derived from economies of scope (e.g., Teece, 1982; Seth, 1990). Related diversifiers capture advantages by sharing inputs in the production of several similar goods. However, costs may also arise from the use of a related strategy. Nayyar (1992) states that for a related strategy to enhance performance, business units must efficiently communicate and cooperate in order to generate synergies. Bureaucratic distortions, intra-firm competition for resources, problems allocating joint costs, or technological inadequacies may reduce and/or eliminate the potential performance enhancing benefits of a related strategy (Palich et al., 2000).

Unrelated strategies, on the other hand, may generate their own financial synergies. One such advantage stems from portfolio theory, where benefits can arise from uncorrelated assets. In an insurance setting, uncorrelated lines of business could result in uncorrelated income streams and uncorrelated losses. Insurers with uncorrelated income streams

should also realize reduced cash flow risk, reduced regulatory risk, and lower insolvency risk. In addition to a reduction in operational risk, industry-wide shocks and catastrophic events will have a less severe impact on an unrelated book of business than a related book. While an unrelated diversification strategy offers a number of benefits, such a strategy could also negatively impact the firm as the result of diseconomies of scope, a lack of synergies between the different business segments, and an increase in operational complexity. Therefore, with theory supporting both arguments, we offer our first hypothesis on the diversification strategy–performance relationship in null form as follows:

H1: *Diversification strategy will have no effect on the performance of diversified firms.*

Organizational Form Hypothesis

Within the population of P/L insurers there exists a variety of organizational forms which are distinctly different from one another. The two most common are stock insurers and mutual insurers, where stock insurers are owned by outside shareholders and mutual insurers are owned by the policyholders. Differences between these groups have been the subject of many empirical investigations.[9] One primary difference is that stock insurers have a stronger mechanism to control managerial opportunism than mutual insurers (Mayers and Smith, 1981, 1982). Within stock insurers the market for corporate control, equity-based compensation, and shareholder monitoring all contribute to controlling agency costs and aligning managerial and owner interests. Because these controls that are commonly in place for stock insurers are not in place (or are not as influential) for mutual insurers, it is argued that mutual insurers should limit the operational freedom of management (i.e., managerial discretion), while managers of stock insurers should be afforded more discretion in pursuing possible value-maximizing projects (Mayers and Smith, 1982). It is reasonable to assume that firms pursuing a related diversification strategy are inherently limiting managerial discretion via choice of similar business lines, whereas firms must allow managers more operational freedom when operating with an unrelated business strategy.

BLRS (2012) document a significant difference in the diversification strategies employed by mutual and stock insurers. They show that mutual insurers exhibit significantly higher levels of related diversification (which

[9]For example, studies have examined differences between the two with regards to risk (Lamm-Tennant and Starks, 1993), capital structure (Harrington and Niehaus, 2002) and efficiency (Cummins, Weiss, and Zi, 1999).

requires less managerial discretion) than do stock insurers. Their finding supports the notion that mutual insurers actively limit managerial scope by choosing more-related business lines, whereas stock insurers allow managers more operational freedom by way of greater unrelated diversification. What remains an open question is whether performance is affected when mutual or stock insurers employ diversification strategies that are inconsistent with that particular organizational form's need to control managerial discretion. Given the findings of prior research, our second set of testable hypotheses are:

H2a: *Mutual insurers that follow a related diversification strategy will outperform mutual insurers that follow an unrelated diversification strategy.*

H2b: *Stock insurers that follow an unrelated diversification strategy will outperform stock insurers that follow a related strategy.*

DATA AND METHODOLOGY

Sample Selection

Our initial sample includes all firms in the National Association of Insurance Commissioners (NAIC) P/L Infopro database for the years 1995 through 2014. Because diversification decisions are likely made at the group level, we aggregate affiliated insurers at the group level (Lamm-Tennant and Starks, 1993; Berger, Cummins, Weiss, and Zi, 2000; Liebenberg and Sommer, 2008; BLRS, 2012). Since we are interested in determining the relation between diversification strategy and performance, we only focus on diversified firms. As such, our first screen removes all monoline insurers. Next, we exclude insurers that are under any regulatory scrutiny.[10] Following Liebenberg and Sommer (2008), we also exclude groups with substantial L/H premiums (at least 25 percent of total premiums) so as to focus on insurers that primarily emphasize the P/L lines of business.[11] Firms that are not organized as either stocks or mutuals are also removed. We then remove any firms that have missing data, or report negative assets.

[10]The NAIC InfoPro database provides information regarding each firm's regulatory status in a given year. We remove firms with the following statuses: (1) firms in conservatorship, (2) firms that are being rehabilitated, (3) firms that are in permanent or temporary receivership, or (4) firms that are being liquidated or have been liquidated. This screen reduces our sample by 35 firm-year observations.

[11]While we include this additional screen in order to remain consistent with prior literature, we recognize that the life and health lines of business can affect diversification relatedness. As such, we re-estimated all models after eliminating this screen and find results that are qualitatively and quantitatively similar those presented in this study.

Finally, we exclude firms with fewer than the five years of historical data that we require in order to compute our risk measure (Grace, 2004; Liebenberg and Sommer, 2008).

Our final sample consists of 891 unique P/L insurers, of which 388 are insurance groups and 503 are unaffiliated insurers. Our initial sample included years 1995 through 2014; however, because five years of historical data are required for the calculation of our risk measure, our sample period is limited to 2000 through 2014. We report 7,901 insurer-year observations, of which 3,607 are group-year observations and 4,294 are unaffiliated observations. These data are used to test the following baseline model:

$$Performance = f(Diversification\ \ Strategy|Controls). \quad (1)$$

Performance Measure Selection

Given that the primary objective of this study is to empirically test the relation between diversification strategy and firm performance, proxies for both performance and diversification strategy must be selected. Of the various performance measures used in the insurance literature, the most common is return on assets (*ROA*).[12,13] However, high performance may be (in part) attributed to the risks associated with an insurer's opportunity set. We therefore follow the prior literature (e.g., Lai and Limpaphayom, 2003; Liebenberg and Sommer, 2008) and use the standard deviation of ROA for the past five years as a measure of risk in our models (*SDROA5*).

Diversification Strategy Measure

Historically, financial economists have found it difficult to objectively measure relatedness for large samples (Fan and Lang, 2000). While SIC codes have commonly been used to measure relatedness,[14] Fan and Lang (2000) argue that SIC classification is not suited to measure differences between segments because they do not reveal relatedness types and thus cannot measure the degree to which segments are related.[15] By focusing on

[12]See, for example, Grace (2004); Elango et al., (2008); Liebenberg and Sommer (2008); and Milidonis and Stathopoulos (2011).

[13]Given that we are interested in differences between stocks and mutuals, we do not consider a market-based performance measure such as Tobin's Q.

[14]Morck, Shleifer, and Vishny (1990) and Berger and Ofek (1995) measure relatedness by counting differing two-, three-, or four-digit SIC coded segments.

[15]Davis and Duhaime (1989), Nayyar (1992), and Villalonga (2004) also note limitations using SIC classifications.

the U.S. P/L industry, we are able to calculate a more objective measure of relatedness than what has been employed in prior studies.

We avoid the shortcomings of discrete measures of relatedness by using a proxy developed by BLRS (2012) that assigns a relatedness score to each insurer based on their own book of business. BLRS (2012) calculate relatedness scores based on the procedure followed by Bryce and Winter (2009).

In this paper, we use the static relatedness scores reported in the appendix of BLRS (2012).[16] These scores, denoted, denote the degree to which lines i and j are related. The scores are bounded between 0 and 1, with higher scores implying greater relatedness. For example, BLRS report a relatedness score of 0.943 for Homeowners' and Auto (implying high relatedness between these lines) and a relatedness score of 0.201 for Homeowners' and Boiler and Machinery (implying low relatedness for these lines). The first step is to calculate how each line an insurer is participating in is related to its remaining book of business:

$$WAR_{kit} = \frac{\Sigma_{j \neq i} R_{ij} NPW_{kjt}}{\Sigma_{i \neq i} NPW_{kjt}} \tag{2}$$

where R_{ij} is the relatedness score reported by BLRS (2012) and NPW_{kjt} represents net premiums written by insurer k in line j in year t. (WAR_{kit}) then represents the percentage of the firm's premiums that are related to line i.

The next step is to average the firm's individual relatedness scores (WAR_{kit}) using line participation as the weights, resulting in the firm-level weighted average relatedness measure, WAR_{kit}:

$$WAR_{kt} = \frac{\Sigma_i NPW_{kit} \times WAR_{kit}}{\Sigma_i NPW_{kit}}. \tag{3}$$

The resulting score increases as insurers write more in related lines of business and decreases as premiums are written in more-unrelated lines of business.[17]

Control Variables

Diversification Extent. While our focus is on the performance effects of diversification *strategy,* prior literature (e.g., Elango et al., 2008) has shown that performance is related to diversification extent. We control for the performance effect of diversification extent using the complement of the

[16]A detailed discussion of how the relatedness scores employed in this study are created is presented in the Appendix of this paper.

Herfindahl-Hirschman Index (HHI) of net premiums written across 24 separate lines of business (*LOBDIV*).[18] We define *LOBDIV* for firm *k* in year *t* as:

$$LOBDIV_{kt} = 1 - \sum_{j=1}^{24} \left(\frac{NPW_{kjt}}{NPW_{kt}} \right) \quad (4)$$

where NPW_{kjt} is firm *k*'s net premiums written in line *j* in year *t*. *LOBDIV* is increasing in diversification and decreasing in concentration.

Size. Hardwick (1997) suggests that large insurers are likely to perform better than small insurers because they can economize on unit costs associated with product innovation and process improvement. Larger insurers may also have lower insolvency risk, which Sommer (1996) argues can translate into higher prices *ceteris paribus*. Cummins and Nini (2002) relate insurer size to market power, where one would expect larger insurers to find greater revenue efficiencies than smaller insurers. Consistent with the extant literature we expect size to be positively related to performance. We measure size as the natural logarithm of total assets (*SIZE*). Because we aggregate insurers at the group level, we follow BLRS (2012) and adjust group assets downward by the total intra-group common and preferred stock holdings.[19]

Capitalization. Sommer (1996) provides evidence that safer insurers are able to command higher prices. We account for insurer capitalization in our models by including the ratio of policyholders' surplus to total admitted assets (*CAPASSETS*). If consumers are willing to pay greater premiums

[17]As an example of how the *WAR* measure is computed, consider a firm that operates in three lines of business in a given year. The lines of business and their associated premiums include Automobile ($500), Homeowners' ($800), and Boiler and Machinery ($400). In order to calculate the *WAR* measure, we first obtain the static relatedness scores from BLRS (2012) for each pairwise grouping:

$$R_{Auto,\ HO} = 0.943,\ R_{Auto,\ B\&M} = 0.197,\ R_{HO,\ B\&M} = 0.201$$

We then create line-specific relatedness scores, WAR_{kit}, which we calculate as:

$$WAR_{k,Auto,t} = \frac{.943(800) + .197(400)}{800 + 400} = 0.694,\ WAR_{k,HO,t} = 0.613,$$
$$\text{and } WAR_{k,B\&M,t} = 0.199$$

Finally, we calculate the firm-level weighted average relatedness score, WAR_{kt}:

$$WAR_{kt} = \frac{500(0.694) + 800(0.613) + 400(0.199)}{1700} = 0.539$$

The 0.539 relatedness score implies that nearly 54 percent of all other combinations are less related while 46 percent of other combinations are *more* related.

to firms that exhibit greater levels of capitalization, we anticipate a positive relationship between insurer capitalization and performance.

Ownership Structure. Our sample contains firms that are classified as either stock insurers or mutual insurers. Agency theory suggests that self-interested managers will maximize their utility at the expense of the firms' owners (Jensen and Meckling, 1976). The market for corporate control aligns the owner-manager conflict in stock insurers, while the mutual form aligns the interests of owners and policyholders (Mayers and Smith, 1981). The empirical evidence on the cost efficiency across organizational forms is mixed, where Cummins et al., (1999) find mutual insurers are less cost efficient than stock insurers while Greene and Segal (2004) find no difference in cost efficiencies between the two forms. More recent literature suggests that stock insurers outperform mutual insurers when using accounting-based performance measures (e.g., Liebenberg and Sommer, 2008; Elango et al., 2008). We control for organizational form by including a binary variable equal to 1 for mutual insurers (*MUTUAL*) and we anticipate a negative relation between this variable and firm performance.

Geographic Diversification. We control for the effects of geographic diversification on performance by including in our models the complement

[18]We follow the line of business convention as established by BLRS (2012). We use the Underwriting and Investment Exhibit (Part 1B—Premiums Written) of an insurers' annual statutory filing as the basis of diversification and relatedness measures. Several lines are logically combined in the following ways:

1. Fire and Allied Lines is defined as the sum of "Fire" (line 1) and "Allied Lines" (line 2).
2. Accident and Health is defined as the sum of "Group Accident and Health" (line 13), "Credit Accident and Health" (line 14), and "Other Accident and Health" (line 15).
3. Medical Malpractice is defined as the sum of "Medical Malpractice—Occurrence" (line 11.1) and "Medical Malpractice–Claims Made" (line 11.2).
4. Products Liability is defined as the sum of "Products Liability—Occurrence" (line 18.1) and "Products Liability—Claims Made" (line 18.2).
5. Auto is defined as the sum of "Private Passenger Auto Liability" (line 19.1, 19.2), "Commercial Auto Liability" (line 19.3, 19.4), and "Auto Physical Damage" (line 21).
6. Reinsurance is defined as the sum of "Nonproportional Assumed Property" (line 30),"Nonproportional Assumed Liability" (line 31), and "Nonproportional Assumed Financial Lines" (line 32).

The final 24 lines are as follows: Accident and Health, Aircraft, Auto, Boiler and Machinery, Burglary and Theft, Commercial Multi-Peril, Credit, Earthquake, Farmowners', Financial Guaranty, Fidelity, Fire and Allied Lines, Homeowners, Inland Marine, International, Medical Malpractice, Mortgage Guaranty, Ocean Marine, Other, Other Liability, Products Liability, Reinsurance, Surety, and Workers' Compensation.

[19]Assets are adjusted in this manner to ensure that all intra-group holdings are not double counted. For example, if insurers A and B are in a group, and Insurer B owns all of Insurer A's stock, the group's assets would effectively double count A's assets if we did not adjust for B's intra-group holdings.

of the geographic HHI, calculated using the proportion of direct premiums written across fifty U.S. states and the District of Columbia (*GEODIV*), as reported in Schedule T (Exhibit of Premiums Written) of the NAIC annual filings. Specifically, *GEODIV* is calculated for insurer k writing business in state s in year t as:

$$GEODIV_{kt} = 1 - \sum_{s=1}^{51} \left(\frac{NPW_{kst}}{NPW_{kt}}\right)^2 \quad (5)$$

where a value closer to 1 suggests a greater degree of diversification while a value closer to 0 suggests a higher degree of concentration. Prior literature (e.g., Liebenberg and Sommer (2008) and Elango et al., (2008)) predicts a negative relation between our *GEODIV* variable and firm performance.

Industry Concentration. We follow Liebenberg and Sommer (2008) and measure industry concentration as follows:

$$WCONC_{kt} = \sum_{j=1}^{24} w_{kjt} \times HHI_{jt} \quad (6)$$

where w_{kjt} is the weight of premiums written by insurer k in line j in year t and HHI_{jt} is an industry-wide, line-specific HHI that measures the relative competitiveness of each line. Insurers with smaller relative values for *WCONC* are writing in competitive lines of business, whereas larger values would indicate higher business concentration and less relative competition. We expect *WCONC* to be positively associated with performance.

Percent of Life/Health Business. While our focus is on the P/L insurance industry, there are some firms in the sample that also write life/health lines of business. Given that writing these lines of business would represent additional levels of diversification that would not otherwise be captured in our model, we follow Liebenberg and Sommer (2008) and include a variable equal to the proportion of life/health premiums to total premiums (*PCTLH*).[20]

Group Membership. Prior literature suggests important differences across firms on the basis of group membership. Cummins and Sommer (1996) and Sommer (1996) argue that consumers should pay less to firms that are members of a group as the group can allow individual members to fail. In other words, members of a group may be viewed by policyholders as being more risky than single unaffiliated insurers. We include a group

[20]For the purpose of the *PCTLH* variable, the denominator is calculated as the sum of total property-liability premiums plus the total of life-health premiums, as reported in the NAIC Life-Health InfoPro database.

binary variable (*GROUP*) equal to 1 for all groups and expect a negative and significant relation between our group variable and firm performance. Definitions and summary statistics are provided in Table 1.

Given that our dataset consists of repeated firm observations over a fifteen-year period, we follow Liebenberg and Sommer (2008) and Elango et al. (2008) and employ a one-way fixed-effects model using time-specific intercepts to test the relationship between diversification strategy and firm performance. The use of time fixed effects allows us to control for time-dependent variation in ROA. In addition to time fixed-effects, we also include line-of-business and state dummy variables to account for performance variation across lines and states. Because firm-level clustering may result in inflated t-statistics due to understated standard errors, we account for repeated firm observations in our analysis by clustering standard errors at the firm level (Petersen, 2009). With the possible endogenous choice of diversification strategy based on concurrent profits, we use a number of methods to ensure consistent estimators. The first method we use to control this possible endogenous choice is to include once lagged relatedness scores as proxies for concurrent firm-level relatedness (as employed by Elango et al., 2008), presented in Equation (7) as:

$$\begin{aligned} ROA_{kt} = {} & \beta_0 + (\beta_1 WAR_{kt} \ \ or \ \ \beta_1 WAR_{kt-1}) + \beta_2 LOBDIV_{kt} \\ & + \beta_3 SIZE_{kt} + \beta_4 CAPASSETS_{kt} + \beta_5 GEODIV_{kt} + \beta_6 WCONC_{kt} \\ & + \beta_7 PCTLH_{kt} + \beta_8 SDROA5_{kt} + \beta_9 MUTUAL_{kt} + \beta_{10} GROUP_{kt} \\ & + \beta_{11-20} Year \ \ fixed \ \ effects_t + \beta_{21-43} Line \ \ controls_{kt} \\ & + \beta_{44-94} State \ \ controls_{kt} + \varepsilon_{kt}. \end{aligned} \tag{7}$$

We further address the endogeneity of *WAR* through the use of a two-stage least squares approach.[21] This approach requires the selection of instruments for *WAR*. We follow Campa and Kedia (2002) and Laeven and Levine (2007) and use exogenously determined industry and geographic variables that are relevant in determining *WAR* but that do not identify with firm-level profitability. Our first instrument is the weighted average of the proportion of premiums attributed to each line of business relative to industry-wide premiums in each line ($WLINESIZE_{kt-1}$).[22] $WLINESIZE_{kt-1}$

[21]Formal testing confirms that WAR_{kt} may suffer from endogeneity. The Durbin-Wu-Hausman test for endogeneity produced a significant test statistic (p = 0.008) when we included the residual in Equation (7) from regressing *WAR* on all exogenous variables plus instrumental variables from Equation (8).

[22]We use line-of-business participation rates as the weights, where relative business line size is that business line's total industry premiums divided by total industry premiums across all 24 lines.

Table 1. Summary Statistics and Variable Definitions (N = 7,901)

Variable	Definition	Mean	Median	Min	Max
WAR	Weighted average relatedness, where values closer to 0 represent lower levels of relatedness.	0.8502	0.9114	0.0912	0.9580
ROA	Return on assets, calculated as the ratio of net income to total assets	0.01867	0.0241	–0.2270	0.1774
SDROA5	Standard deviation of ROA over the previous five years	0.0337	0.0247	0.0004	0.5903
SIZE	Natural logarithm of total assets	18.5898	18.5180	12.9183	26.1376
LOBDIV	One minus the line-of-business Herfindahl-Hirschman Index, calculated using premiums written in 24 distinct lines of business	0.5246	0.4482	0.0919	1.0000
CAPASSETS	Ratio of total policyholders' surplus to total assets	0.4215	0.4257	–14.1917	1.2753
GEODIV	One minus the Herfindahl-Hirschman Index based on geographic participation across 50 states in the U.S. and the District of Columbia	0.4022	0.3561	0.0000	1.0000
WCONC	Sum of industry concentration scores multiplied by line-specific participation	0.0601	0.0569	0.02237	0.4628
PCTLIFE	Proportion of total premiums in life and health lines of business to total property-liability and life-health premiums	0.0079	0.0000	0.0000	0.2499
MUTUAL	Binary variable equal to 1 for mutual insurers, and 0 otherwise	0.5075	1.0000	0.0000	1.0000
GROUP	Binary variable equal to 1 for insurance groups, and 0 otherwise	0.4577	0.0000	0.0000	1.0000

Notes: The sample period covers 1995 through 2014. Five years of lagged consecutive data are required for the computation of *SDROA5*; thus our analyses begin in year 2000. All relevant variables are aggregated at the group level (Berger et al., 2000). Total assets are adjusted downward by total intra-group holdings. *ROA* is trimmed at the 1% and 99% levels.

captures the size of the firm's markets in which they compete. BLRS (2012) use this variable as a proxy for business growth constraints, as firms that operate in relatively small industries may have to expand outside their primary line in order to grow. While this variable is related to *WAR*, it is unrelated to our measure of performance. Our second instrument is $LocalWAR_{kt-1}$, which represents the average relatedness scores across all insurers domiciled in the same state as a given insurer. This measure is similar in spirit to an instrument (W%SINGLE) used by Liebenberg and Sommer (2008) that captures the prevalence of single-line insurers in firms' lines of business. We expect aggregate state-level diversification strategy to be correlated with insurer-specific diversification decisions but not with an insurer's accounting performance.[23] We include these excluded instruments, plus the vector of control variables from Equation (7) (denoted X_{kt}), in the first stage regression shown in Equation (8), which is given as:

$$WAR_{kt} = \delta_0 + \delta_1 LocalWAR_{kt-1} + \delta_2 WLINESIZE_{kt-1} + X_{kt}'\delta + \varepsilon_{kt}. \quad (8)$$

In each of our two-stage models, we formally test these instruments using the Wald test for instrument relevance and Sargan's test for over-identifying restrictions.[24]

EMPIRICAL RESULTS

Diversification Strategy Hypothesis

A univariate analysis of ROA across relatedness deciles is presented in Table 2.

Figure 1 displays a graphical representation of ROA across deciles, where decile 1 contains firms with the lowest *WAR* scores (unrelated diversification strategy) and decile 10 consists of firms with the highest *WAR* scores (related diversification strategy). The results of Table 2 and Figure 1 highlight an inverse relation between relatedness and performance. On average, we find that insurers with relatively unrelated books

[23]See Santalo and Becerra (2008), Campa and Kedia (2002), and Laeven and Levine (2007) for examples of industry-level and geographic-level instruments.

[24]Instruments are tested by a Wald test of their joint significance after regressing *WAR* on the instruments and control variables. Instrument validity is tested via the Sargan test for over-identifying restrictions where the null hypothesis is that the instruments are uncorrelated with the errors. As demonstrated in Tables 3 and 4, the Wald statistic is statistically significant and the statistic associated with the Sargan test is insignificant. These results indicate that our instruments are both valid and relevant.

Table 2. Pairwise Comparison of ROA Across WAR Deciles

Panel A: ROA by WAR decile

	Unrelated Diversification Strategy →									Related Diversification Strategy
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
ROA	2.90%	2.18%	2.20%	1.80%	1.76%	1.81%	1.81%	1.68%	1.57%	0.97%

Panel B: Pairwise ROA t-tests (column minus row)

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
D1	–									
D2	2.86***	–								
D3	2.96***	0.03	–							
D4	4.65***	1.64	1.66*	–						
D5	5.09***	1.92*	1.94*	0.20	–					
D6	4.70***	1.64	1.65*	–0.04	–0.25	–				
D7	4.63***	1.62	1.64	–0.02	–0.22	0.02	–			
D8	5.09***	2.11**	2.14**	0.51	0.34	0.56	0.53	–		
D9	5.53***	2.57***	2.60***	0.99	0.85	1.05	1.01	0.48	–	
D10	6.94***	4.36***	4.40***	3.02***	2.98***	3.11***	3.04***	2.57***	2.14***	–

Notes: T-statistics are reported in Panel B. D1–D10 are the weighted average relatedness deciles (*WAR*). Decile 1 contains firms with the most unrelated books of business (i.e., *WAR* values closer to 0), while Decile 10 contains firms with the most related books of business (i.e., *WAR* values closer to 1). *WAR* measures the relatedness of firm-level diversification. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

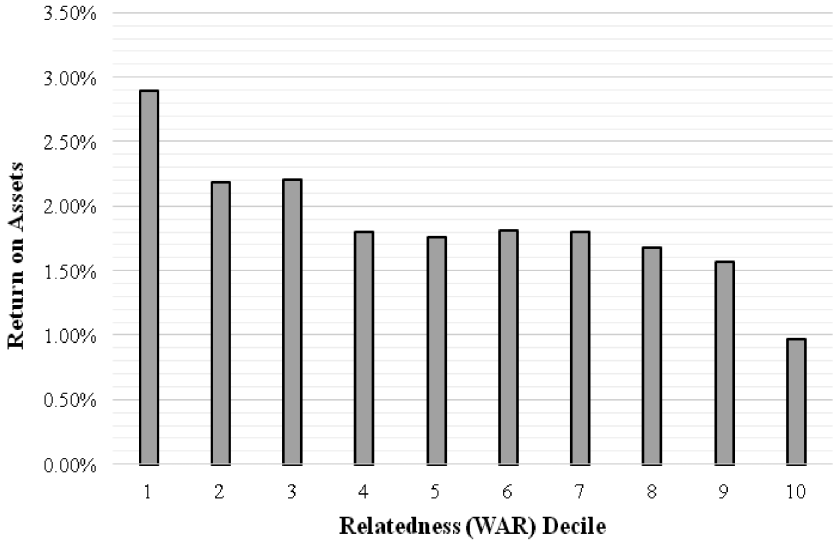

Fig. 1. ROA across relatedness deciles.
Note: Average return on assets for sample firms across relatedness deciles. By construction, firms contained in decile 1 have the lowest levels of relatedness (i.e., an unrelated diversification strategy) while firms in decile 10 exhibit the highest level of relatedness (i.e., a related diversification strategy).

of business outperform insurers with more-related books of business. Table 2 shows that firms in decile 1 significantly outperform all other deciles, and that firms in the tenth decile significantly underperform the remaining nine deciles. More specifically, we find that firms in the first decile exhibit an ROA of approximately 2.90 percent while firms in the tenth decile exhibit an ROA of 0.97 percent. These univariate statistics suggest that firms with the greatest level of unrelated diversification experience an ROA that is over three times that experienced by firms with the greatest level of related diversification.

The univariate statistics discussed above indicate that firms employing a strategy of unrelated diversification exhibit stronger performance than firms employing a strategy of related diversification. We next test each of our hypotheses in a multivariate setting. Table 3 reports the results of our various estimations of Equation (7).

Columns 1 and 2 of Table 3 report standard OLS regression estimates of Equation (7) where relatedness is measured with the raw relatedness score both concurrently and once lagged. Two-stage least squares estimates are reported in column 3. The empirical results suggest a negative relation

Table 3. Diversification Relatedness and Firm Performance

Model	OLS	OLS	2SLS
WAR	–0.046***		–0.130***
	(0.008)		(0.027)
WAR_{t-1}		–0.037***	
		(0.008)	
LOBDIV	–0.009*	–0.009*	–0.010**
	(0.005)	(0.005)	(0.005)
SIZE	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)
CAPASSETS	0.021**	0.021**	0.020**
	(0.010)	(0.010)	(0.010)
GEODIV	–0.008**	–0.007*	–0.010**
	(0.004)	(0.004)	(0.004)
WCONC	–0.014	–0.001	–0.075
	(0.042)	(0.041)	(0.049)
PCTLH	0.051*	0.050*	0.063**
	(0.028)	(0.028)	(0.029)
SDROA5	–0.125***	–0.123***	–0.112**
	(0.042)	(0.042)	(0.045)
MUTUAL	–0.005**	–0.006***	–0.004*
	(0.002)	(0.002)	(0.002)
GROUP	–0.010***	–0.009***	–0.010***
	(0.002)	(0.002)	(0.002)
Constant	–0.041**	–0.047***	0.016
	(0.018)	(0.018)	(0.025)
Instrument Relevance Test			
Wald Statistic			410.40***
Instrument Validity Tests			
Sargan Test			0.971
Observations	7,901	7,901	7,901
R-squared	0.161	0.159	0.136

Table notes continue on next page

Notes: The sample period is 2000 through 2014. Coefficients in columns titled "OLS" are estimated by ordinary least squares regressions. Coefficients in the column titled "2SLS" are estimated using two-stage least squares. When employing the 2SLS approach, the first-stage regresses *WAR* on a set of excluded instruments (*WLINESIZE* and *LocalWAR*) and all other explanatory variables. Instruments are tested by a Wald test of their joint significance after regressing *WAR* on the instruments and controls. Instrument validity is tested via the Sargan test for overidentifying restrictions where the null hypothesis is that the instruments are uncorrelated with the errors. Standard errors are presented below coefficients in parentheses and are corrected for firm-level clustering. All models include year, line of business, and state fixed effects. *WAR* measures the relatedness of firm-level diversification. *LOBDIV* is the complement of the line of business Herfindahl-Hirschman Index. *SIZE* is the natural logarithm of total admitted assets. *CAPASSETS* is the ratio of policyholders' surplus to total admitted assets. *GEODIV* is the complement of the Herfindahl-Hirschman Index of premiums written across the 50 U.S. states as well as in the District of Columbia. *WCONC* is a line-weighted metric of industry concentration. *PCTLH* is the percentage of premiums collected in life and health lines. *MUTUAL* is a binary variable equal to 1 for mutual insurers, 0 otherwise. *GROUP* is equal to 1 if the firm is an aggregated group, 0 if it is a single, unaffiliated insurer. *SDROA5* is the standard deviation of ROA over the past five years. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

exists between relatedness (*WAR*) and firm performance (*ROA*) across each of the three model specifications. These results are consistent with the initial univariate results and indicate that related diversification is, on average, negatively associated with firm performance. We therefore reject Hypothesis 1, and provide initial evidence that related diversification reduces accounting performance among P/L insurers. These findings are consistent with those of Michel and Shaked (1984), Fan and Lang (2000), and Pehrsson (2006).

Benefits to a related strategy depend on the ability of firms to create synergies among similar resources (Teece, 1980). However, these benefits require a high degree of managerial cooperation and communication between business segments. Inefficiencies and other costs can manifest when firms attempt to leverage the same resources for an increased number of activities, thus resulting in poorer performance (Teece, 1982). By contrast, the economic benefits of unrelated diversification are based on efficiency gains due to strong internal systems that can allocate resources and shift risk to performing sectors (Williamson, 1985). These results indicate that: (1) the costs associated with a related strategy outweigh the benefits, or (2) "flexibility" in resource allocation is more valuable than synergy gains from core competencies.

Among the control variables, the coefficients on the *SIZE* variable are positive and significant in each specification in Table 3. This finding is consistent with the extant literature suggesting that larger firms can take advantage of economies of scale or lower insolvency risk (Sommer, 1996).

The coefficient on the capitalization variable (*CAPASSETS*) is positive and significant across the three specifications, indicating that financial flexibility is associated with improved performance. We also find that geographic diversification (*GEODIV*) has a negative and significant relation to firm performance, which is consistent with prior research (Elango et al., 2008). We also report evidence that diversified mutual insurers underperform diversified stock insurers across our sample period. Our findings also indicate that group-affiliated insurers underperform relative to unaffiliated insurers. This negative relation may be due to lower costs of conglomeration, costs of managerial discretion, or inefficient resource sharing between affiliates. Overall, we reject Hypothesis 1, and find that firms following a related diversification strategy underperform those that follow a more unrelated diversification strategy.

Organizational Form Hypothesis

Two primary organizational structures exist within the P/L insurance industry: mutual insurers and stock insurers. As noted previously, the management of a stock insurer will typically be granted greater managerial discretion than the management of a mutual insurer because of potential agency costs (Mayers and Smith, 1982). For diversified firms, following a more related strategy is one method to limit the degree of managerial discretion within an organization,[25] and this could likely lead to performance gains for mutual insurers when compared to stock insurers who do not need to limit managerial discretion. In order to test the potential relations between managerial discretion, diversification strategy, and performance, we re-estimate Equation (7) with a specific focus on the stock and mutual organizational forms, the results of which are presented in Table 4.

The results reported in Table 4 are supportive of Hypothesis 2b and indicate that stock insurers following a more related strategy exhibit weaker profitability compared to stock insurers that follow a more unrelated diversification strategy. Both specifications (OLS and 2SLS) report a negative and significant coefficient on the *WAR* variable (columns 1 and 2) for the stock subsample. Alternatively, the results for the subsample of mutual insurers (columns 3 and 4) suggest that related diversification is unrelated to firm profitability. Taken together, the results presented in Tables 2 and 3 provide evidence of a relatedness-performance relationship that is largely driven by stock insurers.

[25]A notion consistent with the findings of BLRS (2012), which finds that mutual insurers tend to use a related diversification strategy more than stock insurers.

Table 4. Diversification Relatedness and Firm Performance across Organizational Forms

	Stock		Mutual	
Model	OLS	2SLS	OLS	2SLS
WAR	–0.043***	–0.128***	–0.028*	–0.150
	(0.010)	(0.032)	(0.016)	(0.098)
LOBDIV	–0.010	–0.011	–0.011	–0.014
	(0.007)	(0.007)	(0.008)	(0.009)
SIZE	0.004***	0.005***	0.010***	0.010***
	(0.001)	(0.001)	(0.001)	(0.001)
CAPASSETS	0.017*	0.015*	0.061***	0.063***
	(0.009)	(0.009)	(0.007)	(0.007)
GEODIV	–0.014***	–0.017***	–0.007	–0.011
	(0.005)	(0.005)	(0.005)	(0.007)
WCONC	–0.016	–0.084	–0.011	–0.056
	(0.051)	(0.060)	(0.066)	(0.077)
PCTLH	0.116***	0.121***	–0.026	–0.014
	(0.040)	(0.042)	(0.030)	(0.034)
SDROA5	–0.172***	–0.156***	0.055	0.072
	(0.052)	(0.054)	(0.058)	(0.063)
GROUP	–0.010***	–0.010***	–0.012***	–0.015***
	(0.003)	(0.003)	(0.003)	(0.004)
Constant	0.001	0.045*	–0.144***	–0.046
	(0.021)	(0.026)	(0.022)	(0.081)
Instrument Relevance				
Wald Statistic		42.40***		280.76***
Instrument Validity				
Sargan Test		0.254		0.361
Observations	3,891	3,891	4,010	4,010
R-squared	0.167	0.139	0.243	0.214

Notes: The sample period is 2000 through 2014. Coefficients in the columns titled "OLS" are estimated using ordinary least squares regressions. Coefficients in the columns titled "2SLS" are estimated using two-stage least squares. When employing the 2SLS approach, the first-stage regresses *WAR* on a set of excluded instruments (*WLINESIZE* and *LocalWAR*) and all other explanatory variables. Instruments are tested by a Wald test

Table notes continue on next page

of their joint significance after regressing *WAR* on the instruments and controls. Instrument validity is tested via the Sargan test for overidentifying restrictions where the null hypothesis is that the instruments are uncorrelated with the errors. Standard errors are presented below coefficients in parentheses and are corrected for firm-level clustering. All models include year, line of business, and state fixed effects. *WAR* measures the relatedness of firm-level diversification. *LOBDIV* is the complement of the line of business Herfindahl-Hirschman Index. *SIZE* is the natural logarithm of total admitted assets. *CAPASSETS* is the ratio of policyholders' surplus to total admitted assets. *GEODIV* is the complement of the Herfindahl-Hirschman Index of premiums written across the 50 U.S. states as well as in the District of Columbia. *WCONC* is a line-weighted metric of industry concentration. *PCTLH* is the percentage of premiums collected in life and health lines. *GROUP* is equal to 1 if the firm is an aggregated group, 0 if it is a single, unaffiliated insurer. *SDROA5* is the standard deviation of ROA over the past five years. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

ROBUSTNESS

Performance for Newly Diversified Insurers

To further validate our results, we explore profitability differences among newly diversifying firms. This subsample provides a unique setting that allows us to empirically test the *immediate* impact that diversification into related and unrelated business lines has on overall firm profitability. While the prior results indicate that firms with greater levels of unrelated diversification experience higher profitability, we contend that this result should be exhibited for newly diversified firms at the time they make the initial decision to diversify. If the large-sample results are indeed robust, then the firms that picked, as their new business line, an unrelated line should outperform the firms that selected lines that are closely related to their original line of business. We model profitability consistent with Equation (7) and replace the *WAR* variable with variables that measure the *change* in diversification strategy from year *t–1* to year *t*. The first independent variable of interest is the absolute change in *WAR*:

$$\Delta WAR_{kt} = \left| WAR_{kt} - WAR_{kt-1} \right|. \tag{9}$$

For our sample of newly diversifying firms, the prior year's relatedness score is equal to 1 ($WAR_{kt-1} = 1$) and the concurrent relatedness score is less than one, making any change in diversification strategy negative.[26] For ease of interpretation, we use the absolute difference in *WAR* as the

[26]Note that a weighted-average relatedness (*WAR*) score of 1 indicates that the insurer is not diversified (i.e., the firm only writes one line of business).

independent variable, where larger values equate to a more unrelated strategy. We expect ΔWAR to be positively related to performance; that is, firm profitability should increase with the level of unrelatedness between the firm's original line and its new business line. The second measure is a set of binary variables indicating which change-quartile the firm belongs to. Firms with the smallest deviation from a value of 1, $\Delta WARQ1$, are the omitted group. If the results are consistent with our initial findings, we anticipate that firms in the second, third and fourth quartiles ($\Delta WARQ2$, $\Delta WARQ3$, $\Delta WARQ4$) should have better performance relative to firms the first quartile. We identify 314 firms that changed their diversification status during our sample period, and the results of this analysis are presented in Table 5.

The results in Table 5 are consistent with the negative relatedness-performance relationship reported previously in Tables 3 and 4. The coefficient on ΔWAR_{kt} is positive and statistically significant at the one percent level, which suggests that adding unrelated business lines is more profitable than adding lines that match the firm's existing business. When we use the change-quartile indicators, we again find evidence that is consistent with the previously reported results.

The second set of results presented in Table 5 indicates that firms in the fourth change-quartile $\Delta WARQ4$ experience a positive and significantly greater level of performance relative to firms in the first change quartile. In other words, the firms that added the most-unrelated lines of business experienced better performance than those firms that added a line similar to that which was previously written. These results suggest that, on average, firms in the largest change-quartile were 6.8 percent more profitable than firms in the lowest change-quartile. Overall, the results presented in Table 5 provide additional support for our previous findings that firms employing a related diversification strategy experience lower performance relative to firms employing an unrelated diversification strategy.

Diversification, Relatedness, and Performance

The previously discussed results suggest that related diversification negatively influences firm accounting performance, which adds to prior research that finds that diversified insurers incur a diversification penalty (Liebenberg and Sommer, 2008). However, one question that remains is whether the negative relation between diversification and performance is influenced by the type of diversification strategy employed by a given firm. While our results imply that a greater degree of relatedness results in a decline in performance, we have not directly tested the effects of related and unrelated diversification within a single model to parse out the

Table 5. Relatedness and Performance for Newly Diversifying Insurers

Model	OLS	OLS
ΔWAR	0.145***	
	(0.039)	
ΔWARQ2		0.023
		(0.020)
ΔWARQ3		0.024
		(0.020)
ΔWARQ4		0.068***
		(0.020)
LOBDIV	0.014	0.017
	(0.035)	(0.035)
SIZE	–0.000	–0.000
	(0.005)	(0.005)
CAPASSETS	0.015	0.017
	(0.011)	(0.011)
GEODIV	–0.014	–0.010
	(0.019)	(0.019)
WCONC	–0.062	–0.013
	(0.166)	(0.164)
PCTLH	0.000	0.000
	(0.000)	(0.000)
SDROA5	–0.704***	–0.697***
	(0.079)	(0.080)
MUTUAL	0.033*	0.033*
	(0.018)	(0.018)
GROUP	0.013	0.012
	(0.017)	(0.017)
Constant	0.020	0.020
	(0.076)	(0.078)
Observations	314	314
R-squared	0.487	0.502

Table notes continue on next page

Notes: The sample period is 2000 through 2014. The sample consists of firms that were single-line insurers in year *t-1* and added an additional line(s) in year *t*. Coefficients are estimated by ordinary least squares. Δ*WAR* represents the absolute change in the firm's weighted average relatedness. The second specification compares the differences in ROA across relatedness quartiles (*ΔWARq*), where *ΔWARQ1* (firms with the highest relatedness levels) is the omitted group. Standard errors are presented below coefficients in parentheses and are corrected for firm-level clustering. All models include year, line of business, and state fixed effects. *LOBDIV* is the complement of the line of business Herfindahl-Hirschman Index. *SIZE* is the natural logarithm of total admitted assets. *CAPASSETS* is the ratio of policyholders' surplus to total admitted assets. *GEODIV* is the complement of the Herfindahl-Hirschman Index of premiums written across the 50 U.S. states and the District of Columbia. WCONC represents industry concentration. *PCTLH* is the percentage of premiums collected in life and health lines. *MUTUAL* is a binary variable equal to 1 for mutual insurers, 0 otherwise. *GROUP* is equal to 1 if the firm is an aggregated group, 0 if it is a single, unaffiliated insurer. *SDROA5* is the standard deviation of ROA over the past five years. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

influence of each. In order to evaluate the influence of a related and unrelated strategy on firm performance, we first estimate a model identical to that employed by Liebenberg and Sommer (2008) to ensure that our results are similar to theirs using their specification. The dependent variable for the new model is accounting profitability (proxied by ROA) while the independent variable of interest is a binary variable, *MULTLINE*, equal to 1 for firms that operate in two or more lines of business (i.e., diversified firms), and 0 otherwise. We then estimate a second model where the *MULTLINE* binary variable is replaced with a binary variable equal to 1 for firms that are among the top 50 percent of *WAR* (*RELATED*) and another dichotomous variable equal to 1 for firms that are among the bottom 50 percent of *WAR* (*UNRELATED*).[27] Using this approach, we can more clearly separate the influence of related *and* unrelated diversification on firm performance. The dataset used to estimate these models consists of diversified and undiversified firms. Both models are estimated using ordinary least squares regression and standard errors are clustered at the firm level.[28] The results from these estimations are provided in Table 6.

The first column in Table 6 presents the results from the baseline specification following Liebenberg and Sommer (2008). Focusing first on the independent variable of interest, the statistically significant and negative coefficient on the *MULTLINE* variable suggests that diversified firms

[27]The omitted group for this model consists of those firms that are undiversified.

[28]Although the line-of-business diversification (*LOBDIV*) variable was used in our prior empirical models, we exclude the *LOBDIV* variable from these models as the values for the *LOBDIV* and binary diversification variables are both equal to zero for undiversified firms.

have lower levels of profitability relative to undiversified firms. Specifically, the result indicates that, on average, diversified insurers perform approximately half a percent worse than undiversified firms. This finding is comparable to that of Liebenberg and Sommer (2008), who find that accounting profitability for diversified firms is roughly one percent lower than that of undiversified firms. The results on the remaining control variables are largely similar to those presented in Liebenberg and Sommer (2008).

Given that we are able to confirm the findings of Liebenberg and Sommer (2008) using our dataset, we next attempt to disentangle the effects of related and unrelated diversification to determine if either strategy has a greater influence on accounting performance.

The results of this alternative specification are provided in column 2 of Table 6 and they suggest that the negative influence of diversification may largely be attributable to related diversification and not to unrelated diversification. While the coefficient on the *RELATED* binary variable is negative and statistically significant, the coefficient on the *UNRELATED* binary variable is not significantly different from zero.

These results imply that while there is not a statistically significant difference between firms employing a more unrelated diversification strategy and firms that are undiversified, firms that use a related strategy perform nearly one percent worse than undiversified firms. This suggests that the findings presented both in column 1 of Table 6 and in Liebenberg and Sommer (2008) may be due in part to diversification strategy, and results previously reported in this study are largely influenced by related diversification. The fact that a negative relation between related diversification and accounting performance exists may signal that the costs of related diversification such as a greater correlation of earnings streams exceeds benefits associated with scope economies.

CONCLUSION

This article investigates the relation between insurer diversification strategy and firm performance using a sample of diversified U.S. property-liability insurers over a fifteen-year period. Prior literature has evaluated the effect of diversification on insurer performance; however, there is an absence of evidence on the effect of diversification *strategy* for firms that have already made the diversification decision. We are the first to test this relationship using the relatedness measure developed by Berry-Stölzle, Liebenberg, Ruhland, and Sommer (2012). Theory suggests that related

Table 6. Disaggregating the Overall Diversification Effect into Related and Unrelated Diversification

Variables	ROA	ROA
MULTLINE	–0.005*	
	(0.003)	
RELATED		–0.009***
		(0.003)
UNRELATED		–0.003
		(0.003)
SIZE	0.004***	0.005***
	(0.001)	(0.001)
CAPASSETS	0.018**	0.018**
	(0.007)	(0.007)
GEODIV	–0.004	–0.004
	(0.004)	(0.004)
WCONC	0.015	0.013
	(0.030)	(0.030)
PCTLH	0.000*	0.001**
	(0.000)	(0.000)
SDROA5	–0.068***	–0.067***
	(0.025)	(0.025)
MUTUAL	–0.006***	–0.006***
	(0.002)	(0.002)
GROUP	–0.009***	–0.009***
	(0.002)	(0.002)
Constant	–0.057***	–0.059***
	(0.014)	(0.014)
Observations	10,682	10,682
R-squared	0.119	0.120

Notes: The sample period is 2000 through 2014. The sample consists of both diversified and non-diversified firms. Coefficients are estimated by ordinary least squares. Standard errors are presented below coefficients in parentheses and are corrected for firm-level clustering. All models include year, line of business, and state fixed effects. *MULTLINE* is a binary variable equal to 1 for firms with at least two lines of business, 0 otherwise. *RELATED* is a binary variable equal to 1 for diversified firms with above-median WAR, 0 otherwise. *UNRELATED* is a binary variable equal to 1 for diversified firms with below-median WAR, 0 otherwise. *SIZE* is the natural logarithm of total admitted assets. *CAPASSETS* is the ratio of policyholders' surplus to total admitted assets. *GEODIV* is the complement of the Herfindahl-Hirschman Index of premiums written across the 50 U.S. states and the District of Columbia. WCONC represents industry concentration.

Table notes continue on next page

PCTLH is the percentage of premiums collected in life and health lines. *MUTUAL* is a binary variable equal to 1 for mutual insurers, 0 otherwise. *GROUP* is equal to 1 if the firm is an aggregated group, 0 if it is a single, unaffiliated insurer. *SDROA5* is the standard deviation of ROA over the past five years. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

diversifiers should benefit from economies of scope while unrelated diversifiers should benefit from uncorrelated earnings streams.

The primary result of this study is that related diversification negatively impacts accounting performance, *ceteris paribus*. We contend that this result indicates that either (1) the costs associated with a related strategy outweigh the benefits, or (2) "flexibility" in resource allocation is more valuable than synergy gains from core competencies. Given that BLRS (2012) find that mutual insurers tend to use a more related form of diversification relative to stock insurers, we also hypothesized that the diversification strategy–performance relationship would be moderated by organizational form. Our results suggest that stock insurers suffer from a relatedness penalty while mutual insurers do not, which is consistent with differences in managerial discretion across organizational forms and with the findings of BLRS (2012).

We also examine the immediate impact that diversification strategy has on the profitability of firms that move from being a monoline insurer to a multiline insurer. The result of this additional robustness test confirms our general results, where firms that selected more-unrelated business lines outperformed their counterparts that selected lines that are more related to their original line. Finally, we test the influence of both related and unrelated diversification on firm performance and document that while diversified firms experience weaker performance relative to undiversified firms, the negative effect appears to largely be driven by firms employing a related diversification strategy. Overall, our results imply that diversification strategy plays an important role in the performance of insurers, and that the benefits of uncorrelated earnings and losses provide a more substantial benefit than synergistic gains between similar product lines.

REFERENCES

Bae, S. C., T. H. Kwon, and J. W. Lee (2011) "Does Corporate Diversification by Business Groups Create Value? Evidence from Korean Chaebols," *Pacific-Basin Finance Journal* 19: 535–553.

Barney, J. B. (1997) *Gaining and Sustaining Competitive Advantages*, Addison-Wesley.

Berger, A. N., J. D. Cummins, M. A. Weiss, and H. Zi (2000) "Conglomeration versus Strategic Focus: Evidence from the Insurance Industry," *Journal of Financial Intermediation* 9: 323–362.

Berger, P. G. and E. Ofek (1995) "Diversification's Effect on Firm Value," *Journal of Financial Economics* 37: 39–65.

Berger, P. G. and E. Ofek (1999) "Causes and Effects of Corporate Refocusing Programs," *Review of Financial Studies* 12(2): 311–345.

Berry-Stölzle, T. R., A. P. Liebenberg, J. S. Ruhland, and D. W. Sommer (2012) "Determinants of Corporate Diversification: Evidence from the Property-Liability Insurance Industry," *Journal of Risk and Insurance* 79: 381–413.

Berry-Stölzle, T. R., R. E. Hoyt, and S. Wende (2013) "Capital Market Development, Competition, Property Rights, and the Value of Insurer Product-Line Diversification: A Cross-Country Analysis," *Journal of Risk and Insurance* 80: 423–459.

Bryce, D. J. and S. G. Winter (2009) "A General Interindustry Relatedness Index," *Management Science* 55: 1570–1585.

Campa, J. M. and S. Kedia (2002) "Explaining the Diversification Discount," *The Journal of Finance* 57: 1731–1762.

Christensen, H. K. and C. A. Montgomery (1981) "Corporate Economic Performance: Diversification Strategy versus Market Structure," *Strategic Management Journal* 2: 327–343.

Cummins, J. D. and G. P. Nini (2002) "Optimal Capital Utilization by Financial Firms: Evidence from the Property-Liability Insurance Industry," *Journal of Financial Services Research* 21: 15–53.

Cummins, J. D. and D. W. Sommer (1996) "Capital and Risk in Property-Liability Insurance Markets," *Journal of Banking and Finance* 20: 1069–1092.

Cummins, J. D., M. A. Weiss, X. Xie, and H. Zi (2010) "Economies of Scope in Financial Services: A DEA Efficiency Analysis of the US Insurance Industry," *Journal of Banking and Finance* 34: 1525–1539.

Cummins, J. D., M. A. Weiss, and H. Zi (1999) "Organizational Form and Efficiency: The Coexistence of Stock and Mutual Property-Liability Insurers," *Management Science* 45: 1254–1269.

Davis, R. and I. M. Duhaime (1989) "Business Level Data Disclosed Under FASB No. 14: Effective Use in Strategic Management Research," *Academy of Management Proceedings*, Academy of Management.

Elango, B., Y-L. Ma, and N. Pope (2008) "An Investigation into the Diversification-Performance Relationship in the U.S. Property-Liability Insurance Industry," *Journal of Risk and Insurance* 75: 567–591.

Fan, J. P. H. and L. H. P. Lang (2000) "The Measurement of Relatedness: An Application to Corporate Diversification," *Journal of Business* 73: 629–660.

Grace, E. (2004) "Contracting Incentives and Compensation for Property-Liability Insurer Executives," *Journal of Risk and Insurance* 71(2): 285–307.

Greene, W. and D. Segal (2004) "Profitability and Efficiency in the U.S. Life Insurance Industry," *Journal of Productivity Analysis* 21: 229–247.

Hardwick, P. (1997) "Measuring Cost Inefficiency in the UK Life Insurance Industry," *Applied Financial Economics* 7: 37–44.

Harrington, S. E. and G. Niehaus (2002) "Capital Structure Decisions in the Insurance Industry: Stocks versus Mutuals," *Journal of Financial Services Research* 21: 145–163.

Hill, C. W. L., M. A. Hitt, and R. E. Hoskisson (1992) "Cooperative versus Competitive Structures in Related and Unrelated Diversified Firms," *Organization Science* 3: 501–521.

Hoyt, R. E. and J. S. Trieschmann (1991) "Risk/Return Relationships for Life-Health, Property-Liability, and Diversified Insurers," *Journal of Risk and Insurance* 58: 322–330.

Hyland, D. C. and J. D. Diltz (2002) "Why Firms Diversify: An Empirical Examination," *Financial Management* 31: 51–81.

Jensen, M. C. and W. H. Meckling (1976) "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics* 3: 305–360.

Laeven, L. and R. Levine (2007) "Is There a Diversification Discount in Financial Conglomerates?" *Journal of Financial Economics* 85: 331–367.

Lai, G. C. and P. Limpaphayom (2003) "Organizational Structure and Performance: Evidence from the Nonlife Insurance Industry in Japan," *Journal of Risk and Insurance* 70: 735–757.

Lamm-Tennant, J. and L. T. Starks (1993) "Stock versus Mutual Ownership Structures: The Risk Implications," *The Journal of Business* 66: 29–46.

Lang, L. H. P. and R. M. Stulz (1994) "Tobin's Q, Corporate Diversification, and Firm Performance," *Journal of Political Economy* 102(6): 1248.

Lewellen, W. G. (1971) "A Pure Financial Rationale for the Conglomerate Merger," *Journal of Finance* 26: 521–537.

Li, S. X. and R. Greenwood (2004) "The Effect of Within-Industry Diversification on Firm Performance: Synergy Creation, Multi-Market Contact and Market Structuration," *Strategic Management Journal* 25: 1131–1153.

Liebenberg, A. P. and D. W. Sommer (2008) "Effects of Corporate Diversification: Evidence from the Property-Liability Insurance Industry," *Journal of Risk and Insurance* 75: 893–919.

Martin, J. D. and A. Sayrak (2003) "Corporate Diversification and Shareholder Value: A Survey of Recent Literature," *Journal of Corporate Finance* 9: 37–57.

Mayers, D. and C. W. Smith, Jr. (1981) "Contractual Provisions, Organizational Structure, and Conflict Control in Insurance Markets," *The Journal of Business*, 54: 407–434.

Mayers, D. and C. W. Smith, Jr. (1982) "On the Corporate Demand for Insurance," *The Journal of Business* 55: 281–296.

Michel, A. and I. Shaked (1984) "Does Business Diversification Affect Performance?" *Financial Management* 13: 18–25.

Milidonis, A. and K. Stathopoulos (2011) "Do U.S. Insurance Firms Offer the 'Wrong' Incentives to Executives?" *Journal of Risk and Insurance* 78: 643–672.

Morck, R., A. Shleifer, and R. W. Vishny (1990) "Do Managerial Objectives Drive Bad Acquisitions," *Journal of Finance* 45: 31–48.

Nayyar, P. R. (1992) "On the Measurement of Corporate Diversification Strategy: Evidence from Large U.S. Service Firms," *Strategic Management Journal* 13: 219–235.

Palepu, K. (1985) "Diversification Strategy, Profit Performance and the Entropy Measure," *Strategic Management Journal* 6: 239–255.

Palich, L. E., L. B. Cardinal, and C. C. Miller (2000) "Curvilinearity in the Diversification-Performance Linkage: An Examination of Over Three Decades of Research," *Strategic Management Journal* 21: 155–174.

Pehrsson, A. (2006) "Business Relatedness and Performance: A Study of Managerial Perceptions," *Strategic Management Journal* 27: 265–282.

Petersen, M. A. (2009) "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches," *Review of Financial Studies* 22: 435–480.

Rumelt, R. P. (1974) "Strategy, Structure and Economic Performance," Division of Research, Graduate School of Business Administration, Harvard University, Boston, MA.

Rumelt, R. P. (1982) "Diversification Strategy and Profitability," *Strategic Management Journal* 3: 359–369.

Santalo, J. and M. Becerra (2008) "Competition from Specialized Firms and the Diversification-Performance Linkage," *The Journal of Finance* 63: 851–883.

Seth, A. (1990) "Value Creation in Acquisitions: A Reexamination of Performance Issues," *Strategic Management Journal* 11: 99–115.

Shim, J. (2011) "Mergers & Acquisitions, Diversification and Performance in the U.S. Property-Liability Insurance Industry," *Journal of Financial Services Research* 39: 119–144.

Sommer, D. W. (1996) "The Impact of Firm Risk on Property-Liability Insurance Prices," *Journal of Risk and Insurance* 63: 501–514.

Teece, D. J. (1980) "Economies of Scope and the Scope of the Enterprise," *Journal of Economic Behavior and Organization* 1: 223–247.

Teece, D. J. (1982) "Towards an Economic Theory of the Multiproduct Firm," *Journal of Economic Behavior and Organization* 3: 39–63.

Tombs, J. W. and R. E. Hoyt (1994) "The Effect of Product-Line Focus on Insurer Stock Returns," *Proceedings of the International Insurance Society*: 331–339.

Villalonga, B. (2004) "Diversification Discount or Premium? New Evidence from the Business Information Tracking Series," *Journal of Finance* 59: 479–506.

Williamson, O. E. (1985) *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*, Free Press.

APPENDIX

Relatedness Score Computation

The following steps are taken in order to compute line-of-business relatedness scores:

(1) Count the number of P/L insurers that write both line *i* and line *j*, where the total number of insurers writing both lines in the industry is denoted by J_{ij}. Because the value of J_{ij} likely also includes diversification that is either random or the result of "managerial experimentation" (Teece et al., 1994), the value must be adjusted, such that:

$$\tau_{ij} = \frac{J_{ij} - \mu_{ij}}{\sigma_{ij}}, \tag{1}$$

where

$$\mu_{ij} = \frac{n_i n_j}{K}, \tag{2}$$

and

$$\sigma_{ij}^2 = \mu_{ij}\left(1 - \frac{n_i}{K}\right)\left(\frac{K - n_j}{K - 1}\right) \tag{3}$$

where μ_{ij} represents the expected number of insurers that write in both lines *i* and *j*, n_i represents the number of firms writing line of business *i*, n_j represents the number of firms writing line of business *j*, and *K* represents the total number of insurers. Thus, τ_{ij} is a standardized measure of the number of firms writing both lines *i* and *j* above and beyond what would be expected due to randomness.

(2) As noted by Bryce and Winter (2009) and BLRS (2012), the computed relatedness score represents the standardized number of firms writing lines *i* and *j*, but this number does not reflect the *economic importance* of the pairing for the average firm writing the two lines of business. In order to generate a value that accounts for the economic importance of the pairing, one must first compute a distance matrix, which is generated by calculating the maximum relatedness score, τ_{ij}, for each combination of lines *i* and *j* and subtract all relatedness scores from the maximum score, given as:

$$\max(\tau) - \tau_{ij}. \tag{4}$$

This then results in a distance matrix where the values within each cell represent the distance between each pairing *i* and *j* from the most common line-of-business pairing. Within the matrix cells, low values suggest higher levels of relatedness while higher values suggest lower levels of relatedness.

(3) After generating the distance matrix, each cell is weighted by the average of insurer premiums written associated with the combination of lines *i* and *j*. The average industry weight, S_{ij}, is given as:

$$S_{ij} = \frac{\Sigma_k min_k(NPW_i, NPW_j) I_{ijk}}{\Sigma_k I_{ijk}} \tag{5}$$

where I_{ijk} is a binary variable equal to 1 if insurer *k* writes both business lines *i* and *j*, and 0 otherwise. NPW_i denotes total net premiums written in line *i*. Each cell in the distance matrix Λ_{ij} is then weighted as:

$$\Lambda_{ij} = \frac{\max(\tau) - \tau_{ij}}{S_{ij}} \tag{6}$$

(4) After weighting each cell, one must then solve for the shortest path distance between each line-of-business pair in the weighted matrix in order to generate scores even for those pairs that do not currently exist.[29]

(5) After solving for shortest path distances, the matrix is converted into a similarities matrix so larger values represent greater levels of relatedness and smaller values represent lower levels of relatedness. This is done by subtracting each path score from the maximum distance score.

(6) In order to improve ease of interpretation, the scores calculated in step 5 are converted into percentile relatedness scores, R_{ij}. By converting the values into percentile relatedness scores, the score identifies where each pair of lines lies in the distribution of all pairs. For instance, a relatedness score of .94 for two particular lines implies that 94 percent of all other line combinations are *less* related while 6 percent of other line combinations are *more* related.

[29] As described by BLRS (2012), this may be thought of as an attempt to determine the driving distance between two cities that are not directly connected by a road. If City A is connected to City C by road X and City B is also connected to City C by road X, distance can be measured between cities A and B even if a direct link does not exist.